

Applicant : J. Stuart Cumming
Appl. No. : 09/574,441
Examiner : David H. Willse
Docket No. : 13533.4024

IN THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (previously amended) An intraocular lens assembly for increased depth of focus, comprising:

a frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on an outer periphery of the frame, said frame being configured to rigidly vault posteriorly in an eye of a person,

said frame having end portions to engage in the periphery of the capsular bag of an eye,

said frame defining an opening disposed through said frame, said opening positioned between inner portions of said haptics,

an optic sized and configured to engage in an edge portion of said frame opening, and

interengaging features on the frame and on the optic for attachment of the optic to the frame for limited anterior optic movement relative to the frame,

whereby light refracted by the cornea of the eye travels in an increased distance to the optic to substantially increase depth of focus.

2. (currently amended) An assembly according to Claim 1, wherein:

said optic has a thickness substantially less than the thickness of a natural human ~~optic~~ lens.

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3. (previously amended) An assembly according to Claim 3, wherein the optic is about 1.0 mm in thickness.

4. (previously amended) An assembly according to Claim 3, wherein the optic has a thickness between 0.5 mm and 1.5 mm.

5. (original) An assembly according to Claim 1, wherein:
said interengaging features comprise transverse slots in the frame spaced oppositely from said opening, and mounting portions extending oppositely from the optic and having transverse ridges at end portions thereof for retention in the slots.

6. (original) An assembly according to Claim 5, wherein at least one of said slots has a widened portion with slot end shoulders to retain at least one of said ridges for prevention of optic lateral movement.

7. (original) An assembly according to Claim 6, wherein each of said slots has a widened portion with end shoulders to retain the optic against lateral movement.

8. (original) An assembly according to Claim 1, and further including:
an edge portion of the frame about said frame opening extending posteriorly to engage the optic farther posteriorly.

Claims 9-11 (cancelled)

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12. (currently amended) An intraocular lens assembly for increased depth of focus, comprising:

a frame of generally rigid material and configured to vault posteriorly in an eye of a person, said frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on the outer periphery of the frame,

said frame defining a central opening disposed through said frame,

said frame having transverse slots spaced oppositely from said frame opening,

and

an optic adapted to be disposed adjacent said frame opening, said optic having mounting portions extending oppositely therefrom for engagement in said frame slots to retain the optic relative to the frame but allow anterior movement of the ~~optic~~ optic relative to the frame,

whereby light refracted by the cornea of the eye travels in an increased distance to the optic to substantially increase depth of focus.

13. (currently amended) An assembly according to Claim 12, wherein:

said optic has a thickness substantially less than the thickness of a natural human ~~optic~~ lens.

14. (original) An assembly according to Claim 13, wherein the optic is about 1.0 mm in thickness.

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15. (original) An assembly according to Claim 13, wherein the optic has a thickness between 1.5 mm and 1.5 mm.

16. (original) An assembly according to Claim 12, wherein:
said optic mounting portions extending oppositely from the optic have transverse ridges at end portions thereof for retention in the slots.

17. (original) An assembly according to Claim 16, wherein at least one of said slots has a widened portion with slot and shoulders to retain at least one of said ridges to retain the optic in position.

18. (original) An assembly according to Claim 16, wherein each of said slots has a widened portion with end shoulders to retain the optic against lateral movement.

19. (original) An assembly according to Claim 12, and further including:
an edge portion of the frame adjacent to said frame opening extending posteriorly to engage the optic farther posteriorly.

Claims 20-22 (cancelled)

23. (original) An assembly according to Claim 12, wherein:
a loop portion extends from the outer end portion of each haptic and transversely of the lens to engage the peripheral portions of the capsular bag.

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24. (cancelled)

25. (original) An assembly according to Claim 12, wherein said mounting portions of the optic comprise ridges, and at least one of said ridges has a passage therethrough to facilitate insertion and engagement of the optic mounting portion in the slot.

26. (original) An apparatus according to Claim 25, wherein each of the oppositely extending mounting portions has a passage therethrough.

27. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a pair of rigid spaced-apart posteriorly vaulted frame members adapted for engagement with the periphery of a capsular bag of the eye, said pair of frame members disposed oppositely and longitudinally about an optic, said frame members having end portions extending oppositely and transversely to engage in the peripheral portion of the capsular bag, said frame members having lateral edges disposed on the outer periphery of the frame members, and

a web secured to and extending between said frame members and having thereon said optic.

28. (withdrawn) An intraocular lens assembly according to Claim 27, wherein said frame members have end loop portions extending oppositely and transversely to engage in the peripheral portion of the capsular bag.

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29. (withdrawn) An intraocular lens assembly according to Claim 28, wherein said loop portions are extensions of the frame members.

30. (cancelled)

31. (withdrawn) An intraocular lens assembly according to Claim 27, wherein the web being secured to the frame members by integral molding with the frame members.

32. (withdrawn) An intraocular lens assembly according to Claim 27, wherein the web being secured to the frame members by spot-welding.

33. (withdrawn) An intraocular lens assembly according to Claim 27, wherein the web being secured to the frame members by fastener elements.

34. (withdrawn) An intraocular lens assembly according to any one of Claims 1, 12 or 27, wherein the optic is formed of a flexible optical material.

35. (withdrawn) An intraocular lens assembly according to Claim 1, wherein the frame is formed of a generally rigid material and the optic is formed of a flexible optical material.

36. (cancelled)

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37. (withdrawn) An intraocular lens assembly according to Claim 27, wherein the frame members have folding portions formed of a relatively soft material to provide for folding of the frame for insertion into an eye.

38. (cancelled)

39. (previously presented) An intraocular lens assembly for increased depth of focus, comprising:

a frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on an outer periphery of the frame, said frame being configured to vault posteriorly in an eye of a person,

said frame having end portions to engage in the periphery of the capsular bag of an eye,

said frame defining a generally circular opening disposed through said frame, said opening positioned between inner portions of said haptics,

an optic sized and configured to engage in an edge portion of said frame opening, and

interengaging features on the frame and on the optic for attachment of the optic to the frame for limited optic movement relative to the frame, said interengaging features comprising transverse slots in the frame spaced oppositely from said opening, and mounting portions extending oppositely from the optic and having transverse ridges at the end portions thereof for retention in the slots, at least one of said slots having a widened portion with slot end shoulders to retain at least one of said ridges

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for prevention of optic lateral movement, and a notch extending from at least one of said slots adjacent to said frame opening to facilitate folding of the frame for insertion thereof through a slit in an eye,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

40. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on an outer periphery of the frame, said frame being configured to vault posteriorly in an eye of a person,

said frame having end portions to engage in the periphery of the capsular bag of an eye,

said frame defining a generally circular opening disposed through said frame, said opening positioned between inner portions of said haptics,

an optic sized and configured to engage in an edge portion of said frame opening, and

interengaging features on the frame and on the optic for attachment of the optic to the frame for limited optic movement relative to the frame, said interengaging features comprising transverse slots in the frame spaced oppositely from said opening, and mounting portions extending oppositely from the optic and having transverse ridges at end portions thereof for retention in the slots, at least one of said slots having

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a widened portion with slot end shoulders to retain at least one of said ridges for prevention of optic lateral movement, and a notch extending from each of said slots toward said frame opening for facilitating the folding of the frame for insertion thereof through a slit in an eye,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

41. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on an outer periphery of the frame, said frame being configured to vault posteriorly in an eye of a person,

said frame having end portions to engage in the periphery of the capsular bag of an eye,

said frame defining a generally circular opening disposed through said frame, said opening positioned between inner portions of said haptics,

an optic sized and configured to engage in an edge portion of said frame opening, and

interengaging features on the frame and on the optic for attachment of the optic to the frame for limited optic movement relative to the frame, said interengaging features comprising transverse slots in the frame spaced oppositely from said opening, and mounting portions extending oppositely from the optic and having transverse

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ridges at end portions thereof for retention in the slots, at least one of said slots has a widened portion with slot and end shoulders to retain at least one of said ridges for prevention of topic lateral movement, and a portion of the haptic between each slot and said frame opening having a reduced longitudinal dimension to facilitate folding of the frame longitudinally for insertion of the frame through a slit in an eye,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

42. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a frame of generally rigid material and configured to vault posteriorly in an eye of a person, said frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on the outer periphery of the frame,

said frame defining a central generally circular opening disposed through said frame,

said frame having transverse slots spaced oppositely from said frame opening, and

an optic adapted to be disposed adjacent said frame opening, said optic having mounting portions extending oppositely therefrom for engagement in said frame slots to retain the optic relative to the frame, said optic mounting portions extending oppositely from the optic having transverse ridges at end portions thereof for retention in the slots, and

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a notch extending from at least one of said slots toward said frame opening to facilitate folding of the frame for insertion thereof through a slit in an eye,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

43. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a frame of generally rigid material and configured to vault posteriorly in an eye of a person, said frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on the outer periphery of the frame,

said frame defining a central generally circular opening disposed through said frame,

said frame having transverse slots spaced oppositely from said frame opening, and

an optic adapted to be disposed adjacent said frame opening, said optic having mounting portions extending oppositely therefrom for engagement in said frame slots to retain the optic relative to the frame, said optic mounting portions extending oppositely from the optic having transverse ridges at end portions thereof for retention in the slots, and a notch extending from each of said slots toward said frame opening for facilitating the folding of the frame for insertion thereof through a slit in an eye,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

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44. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a frame of generally rigid material and configured to vault posteriorly in an eye of a person, said frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on the outer periphery of the frame,

said frame defining a central generally circular opening disposed through said frame,

said frame having transverse slots spaced oppositely from said frame opening, and

an optic adapted to be disposed adjacent said frame opening, said optic having mounting portions extending oppositely therefrom for engagement in said frame slots to retain the optic relative to the frame, said optic mounting portions extending oppositely from the optic having transverse ridges at end portions thereof for retention in the slots, and a portion of the haptic between each of said slots and said frame opening having a reduced longitudinal dimension to facilitate folding of the frame longitudinally for insertion of the frame through a slit in an eye,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

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45. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a frame of generally rigid material and configured to vault posteriorly in an eye of a person, said frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on the outer periphery of the frame,

said frame defining a central generally circular opening disposed through said frame,

said frame having transverse slots spaced oppositely from said frame opening, and

an optic adapted to be disposed adjacent said frame opening, said optic having mounting portions extending oppositely therefrom for engagement in said frame slots to retain the optic relative to the frame wherein an enlarged opening is defined in each of said haptics, and extends into proximity with said slots to define a substantially narrow hinge portion to substantially narrow haptic portions to facilitate bending of the lens along its longitudinal axis,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

46. (withdrawn) An intraocular lens assembly for increased depth of focus, comprising:

a pair of relatively rigid spaced-apart frame members adapted for engagement with the periphery of a capsular bag of the eye, said pair of frame members disposed

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oppositely and longitudinally about said optic, said frame members having end portions extending oppositely and transversely to engage in the peripheral portions of the capsular bag, said frame members having lateral edges disposed on the outer periphery of the frame members, and

a web secured to and extending between said frame members and having thereon an optic, the web having portions extending oppositely from the optic, the web portions being bifurcated and having lugs and loops thereon, and said frame members having slits defined therein to receive the lugs of the web portions, and the lugs and loops being generally disposed equidistant from a center of the optic.

47. (previously presented) An intraocular lens assembly for increased depth of focus, comprising:

a frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on an outer periphery of the frame, said frame being configured to vault posteriorly in an eye of a person,

said frame defining a generally circular opening disposed through said frame, said opening positioned between inner portions of said haptics,

an optic sized and configured to engage in an edge portion of said frame opening, and interengaging features on the frame and on the optic for attachment of the optic to the frame for limited optic movement relative to the frame, and wherein the frame has folding portions formed of a relatively soft material to provide for folding of the frame for insertion into an eye,

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whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

48. (previously presented) An intraocular lens assembly for increased depth of focus, comprising:

a frame of generally rigid material and configured to vault posteriorly in an eye of a person, said frame having haptics extending oppositely and longitudinally, said haptics having lateral edges disposed on the outer periphery of the frame,

said frame defining a central generally circular opening disposed through said frame,

said frame having transverse slots spaced oppositely from said ~~frame~~ frame opening, and

an optic adapted to be disposed adjacent said frame opening, said optic having mounting portions extending oppositely therefrom for engagement in said frame slots to retain the optic relative to the frame, and wherein the frame has folding portions formed of a relatively soft material to provide for folding of the frame for insertion into an eye,

whereby light refracted by the cornea of the eye travels an increased distance to the optic to substantially increase depth of focus.

49. (withdrawn) An intraocular lens assembly according to Claim 27, wherein said lens assembly is foldable longitudinally through the optic but rigid in each of the two haptics.

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50. (currently amended) An intraocular lens assembly for increased depth of focus, comprising:

a posteriorly vaulted longitudinally rigid frame adapted for engagement with the ~~periphery~~ posterior of a capsular bag of an eye, said frame having flexible tangential end portions extending oppositely to engage in a peripheral portion of the capsular bag, and

an optic comprising a flexible optic disposed in an opening in the frame and having attachments for allowing movement of the optic relative to the frame, and the lens assembly being constructed to be foldable longitudinally.

51. (cancelled)

52. (new) An intraocular lens assembly for increased depth of focus, comprising:

a posteriorly vaulted rigid frame for implantation in a capsular bag of an eye and adapted for engagement with the periphery of a capsular bag of an eye, said frame having end portions extending oppositely to engage in a peripheral portion of the capsular bag, said frame having haptics extending oppositely and longitudinally, and the frame having an opening therethrough between inner portions of the haptics, and

an optic comprising a flexible optic and attachments for allowing movement of the optic relative to the frame, the optic being configured to engage in an end portion of the frame opening, and the lens assembly being constructed to be foldable longitudinally.